North Island Straits

Shellfish Aquaculture

Barriers & Constraints Study

Edwin Blewett & Associates Inc
2025 West 42nd Avenue, Suite 300
Vancouver, BC V6M 2B5
(604) 263-7615
blewett@telus.net

Nelson Bros Fisheries Ltd
2319 - 129A Street
Surrey, BC V4A 9H1
(604) 541-9386
Stuart_Nelson@telus.net

April 2003

Table of Contents

Executive Summary iii

Introduction 1

Study Methodology 1

Defining The Opportunity 2

The Production-Oriented Approach 3

Biophysical Attributes 4

Barriers & Constraints 4

Opportunities 5

Regulatory 5

Barriers & Constraints 5

Opportunities 5

Financial/Capital 6

Barriers & Constraints 7

Opportunities 7

Human Resources 8

Entrepreneurs 8

Farm Operations Crew 9

Processing Operations Staff 10

Training 10

Shellfish Aquaculture Operations 11

Transportation 11

Barriers & Constraints 12

Opportunities 12

Processing/Marketing 12

Barriers & Constraints 13

Opportunities 13

Intra-Regional Linkages 14

Summary of Barriers & Constraints and Opportunities 14

Assessment of North Island Straits Shellfish Aquaculture Opportunity from the Production Perspective 17

Pitfalls of the Production Perspective 18

Rationale for a Market-Driven Approach 18

The Market-Driven Approach 19

Market Research 19

Marketing Plan 21

Shellfish Farm Economics 23

Business Overhead 24

Capitalization 24

Assessment of North Island Straits Shellfish Aquaculture Opportunity from a Market Perspective 25

Summary & Conclusions 26

Acknowledgements 26

Appendix A: Study Area Background 28

Community Infrastructure and Services 29

Aquaculture 30

Transportation Access and Infrastructure 31

Appendix B: People Interviewed during Visit to Study Area 32

Appendix C: Information Session Participants 33

Executive Summary

British Columbia's strategy to renew the provincial seafood industry includes expansion of the commercial shellfish aquaculture industry, especially into new areas that have demonstrated optimum biophysical capability.

The *North Island Straits Coastal Plan* identified opportunities for use of near-shore and foreshore sub-tidal areas for shellfish aquaculture but determined that the availability of land is only one factor among several that might influence private sector investors and businesses to apply for tenure in the area covered by the Plan. The NIS Coastal Plan therefore recommended a study of economic and business barriers and constraints to the development of shellfish aquaculture in the North Island Straits Study Area.

Edwin Blewett & Associates Inc and Nelson Bros Fisheries Ltd were selected through a competitive tendering process to conduct the North Island Straits Shellfish Aquaculture Barriers and Constraints Study.

The Barriers and Constraints Study was initiated so that a perceived opportunity for the North Island Straits Study Area – shellfish aquaculture development – could be objectively analyzed and evaluated.

The default, or traditional, way of viewing the North Island Straits shellfish aquaculture opportunity is that the Region has the potential to produce "industrial" volumes of shellfish from which economic and employment benefits will flow. In this report we refer to this business rationale as the "production-oriented approach". While there is nothing inherently wrong with the supply of raw materials for subsequent processing and marketing, we gauge that an industry that develops without due regard for markets and the needs of consumers will face future limitations.

An alternative approach or philosophy would be to premise North Island Straits shellfish aquaculture development on exploiting identified market opportunities, with production of shellfish a strategy to serve markets, rather than a business-end in itself. We refer to this approach as the "market-driven approach".

In this report, we assess both the production and the market-driven approaches.

Our findings on Barriers and Constraints to, and Opportunities for, shellfish aquaculture production in the North Island Straits Study Area are summarised in the following table.

Item	Barriers & Constraints	Opportunities
Biophysical Attributes	Specific attributes of potential sites are unknown (eg, tide, wind, exposure, temperature). There is a "learning curve" associated with every site, as the operator becomes familiar with local conditions. Productivities, yields and such vary with the experience and knowledge of operators and biophysical parameters vary across sites.	One way to reduce the risks identified would be to start with pilot or small scale operations to confirm positive biophysical attributes at selected sites and gain insight into expected growth rates and yields. Governments have in the past granted subsidies for first entrants as a reward for generating "intelligence" to benefit those who follow.
Regulatory	The tenure process is extremely slow, expensive, and frustrating for applicants. For some, inability to secure tenure is a "deal-breaker"; it saps the entrepreneurial spirit. Various levels of government compound the problem (eg, Agriculture, Food and Fisheries BC, Water and Land BC, Fisheries and Oceans Canada and Transport Canada (Navigable Waters)). Currently, there are no facilities for water quality testing.	The Economic Development Office of the Regional District has developed a plan to pre-approve a suite of "Shellfish Development Areas" that it would make available to prospective shellfish aquaculture developers. Implementing this plan requires the cooperation at a minimum of the agencies cited.
Financial/Capital	Nature of shellfish aquaculture – upfront and ongoing investment, no cash flow for 2+ years. No ability to service debt until first "crop" harvested. Substantial risk – uncertain yields, volumes, and values. Security problematic. A speculative enterprise for first few years. Points to large equity investment.	Expansion/re-location of an existing operator would be less risky than a start-up by a new operator. Business strategies to shorten the lag between investment and returns would improve the profile of a venture.
Human Resources—Entrepreneurs	There appear to be few individuals/small businesses in the NIS Study Area with a passion to enter the business. Shellfish farming is typically labor intensive and returns are modest. This suggests that a shellfish aquaculture investment may equate to "buying yourself a job". Few individuals/small businesses have the wherewithal to fund a start-up farm.	Expansion/re-location of existing operators may provide the "push". Shellfish farming may be a good fit for ex-fishermen or under-employed fishermen given their skills, assets, lifestyles and expected incomes.

Item	Barriers & Constraints	Opportunities
Human Resources—Farm Operations Crew	Potential farm sites tend to be well-removed from population centers implying travel time via small vessels. Wages may be modest when compared to traditional fishing, forestry, and mining wage levels. Year-round farm jobs may conflict with other seasonal activities. NIS Study Area residents lack direct shellfish aquaculture experience.	The area currently suffers from high unemployment. Many un-employed or under-employed persons have highly transferable skills.
Human Resources—Training	Few residents of the NIS Study Area are currently trained in shellfish husbandry practices. Few plant employees are currently skilled in shellfish-handling. Broader business skills are also a prerequisite. Much of the required knowledge base derives from "working the grounds" and cannot be gained in the classroom.	Collectively, Malaspina College and North Island College (perhaps in conjunction with BCIT and the BC Shellfish Growers Association) are capable of delivering specific training programs for both husbandry and processing functions.
Shellfish Aquaculture Operations	The learning curve associated with greenfield operations (ie, survival rates, grow-out rates, lack of trained staff) create an initial competitive disadvantage relative to established operators. Productivity of the grounds in the NIS Study Area is uncertain. Remoteness (ie, higher costs to bring-in supplies and labour and to ship out finished product) means some level of ongoing cost disadvantage for shellfish aquaculture operations in the NIS Study Area.	Explore non-traditional species where biophysical characteristics of the NIS Study Area may prove advantageous. The potential for larger farms in the NIS Study Area, compared to established areas, may offset possible yield disadvantages.
Transportation	North Island Straits operations will bear additional trucking costs compared to mid or south Island operations. Incremental transport costs apply to both supplies/inputs and shipping of finished product.	Availability of trucks to transport supplies and finished product is not an issue. The area is already a hub of activity for offloaded wild seafood and processed farmed salmon.

Item	Barriers & Constraints	Opportunities
Processing/Marketing	There are currently no major processors in the NIS Study Area engaged in the shellfish aquaculture business. No firms canvassed (Keltic, Alpha & Omega, Englewood) have an immediate interest in taking a position in shellfish processing/marketing. Some processors in other locations are reported to be reluctant to take on new (and even existing) production.	Keltic Seafoods is interested in custom processing shellfish and is willing to invest in Certification and employee training. Alpha & Omega may have surplus cold storage space becoming available that could accommodate small start-up volumes of shellfish aquaculture product. Unloading operations such as Cove Fish are seeking expansion/diversification opportunities. There is strong likelihood that shellfish production could be handled, if not marketed, by local firms.

The following conclusions can be drawn by weighing barriers & constraints against opportunities.

- Production of shellfish in the NIS Study Area is realistic. Biophysical attributes are likely to be attractive and much of the required infrastructure is in place.
- NIS Study Area producers would face the risks associated with business start-ups (eg. uncertain site attributes, grow-out rates & yields, new personnel).
- NIS Study Area farm operations would operate at an ongoing marginal cost disadvantage compared to mid/south Island farms (eg, extra 3-4 cents/lb trucking on finished product).
- Physical infrastructure and human resources not currently present could be developed.
- Marketing of production poses daunting challenges.

In our estimation, the North Island Straits Region possesses the physical and human resource attributes to become, over time and with appropriate investment and training, a legitimate producer of shellfish aquaculture products. It would in our opinion be a mistake, however, to proceed with large scale shellfish aquaculture development without prior consideration of market factors. Development of shellfish *marketing capacity* within the North Island Straits would go a long way to ensuring that the region maintains control of its shellfish aquaculture destiny.

Introduction

British Columbia's strategy to renew the provincial seafood industry includes expansion of the commercial shellfish aquaculture industry, especially into new areas that have demonstrated optimum biophysical capability.

The *North Island Straits Coastal Plan* identified opportunities for use of near-shore and foreshore sub-tidal areas for shellfish aquaculture but determined that the availability of land is only one factor among several that might influence private sector investors and businesses to apply for tenure in the area covered by the Plan. The NIS Coastal Plan therefore recommended a study of economic and business barriers and constraints to the development of shellfish aquaculture in the North Island Straits Study Area.

Edwin Blewett & Associates Inc and Nelson Bros Fisheries Ltd were selected through a competitive tendering process to conduct the North Island Straits Shellfish Aquaculture Barriers and Constraints Study.

Some background information on the North Island Straits Study Area drawn from the Coastal Plan is provided in Appendix A.

Study Methodology

To complete this assignment we took the following steps.

At the outset of the project in January, 2003, we held discussions with the project authority (officials from the Ministries of Agriculture, Food and Fisheries, and Sustainable Resource Management) regarding project objectives and deliverables.

We then reviewed several recent studies specific to shellfish aquaculture development, among them:

- Marketing Plan for Shellfish Industry Investment Attraction; New Marine Frontier Project; Blair Salter, February, 2003.
- Shellfish Industry Economic Impact Analysis; New Marine Frontier Project; Blair Salter, December, 2002.
- First Nations Shellfish Aquaculture Regional Business Strategy – BC Central and North Coast; Kingzett Professional Services; November, 2002.
- Profile and Potential of the BC Shellfish Aquaculture Industry 2002; New Marine Frontier Project; Kingzett Professional Services Ltd; June, 2002.

In mid-February, 2003, we visited the Study Area for two days, meeting with local economic development officers, processing company representatives, civic politicians, and others with an interest in shellfish aquaculture development in the North Island Straits Study Area. Contacts are listed in Appendix B.

Based on our research and consultations to date, we prepared an Interim Report incorporating our analysis and impressions. A presentation version of the Interim Report was delivered at an Information Workshop held in Port Hardy on March 25, 2003, and is appended to this report. This session, advertised in advance in the local media, was attended by approximately 25 residents of the Study Area. Information Workshop participants are listed in Appendix C.

Feedback from the Information Workshop was incorporated into this Final Report.

Defining The Opportunity

The Barriers and Constraints Study was initiated so that a perceived opportunity for the North Island Straits Study Area – shellfish aquaculture development – could be objectively analyzed and evaluated.

Three major factors point to an economic opportunity for the North Island Straits:

1. The availability of numerous and sizeable inter-tidal and sub-tidal sites with strong biophysical potential for shellfish aquaculture.
2. A need, a desire, and the energy to develop economic and employment engines in the North Island Straits Region.
3. Generally strong worldwide markets for seafood in general and shellfish in particular.

To lay a solid foundation for evaluation of the shellfish aquaculture opportunity in the North Island Straits Region, the nature of the opportunity must be well understood.

The default, or traditional, way of viewing the North Island Straits shellfish aquaculture opportunity is that the Region has the potential to produce "industrial" volumes of shellfish from which economic and employment benefits will flow. In this report we refer to this business rationale as the "production-oriented approach". While there is nothing inherently wrong with the supply of raw materials for subsequent processing and marketing, we gauge that an industry that develops with-

out due regard for markets and the needs of consumers will face future limitations.

An alternative approach or philosophy would be to premise North Island Straits shellfish aquaculture development on exploiting identified market opportunities, with production of shellfish a strategy to serve markets, rather than a business-end in itself. We refer to this approach as the "market-driven approach".

We explore and examine these perspectives in turn.

The Production-Oriented Approach

We first examine the potential for North Island Straits shellfish aquaculture from the production-oriented perspective, with particular regard to the elements specified in the Terms of Reference as possible barriers or constraints to the development of shellfish aquaculture in the Study Area.

The production perspective could be expressed as follows:

As identified in the NIS Coastal Plan, the NIS Study Area possesses a wealth of sites with shellfish aquaculture potential. The area is in need of economic development and employment and possesses at least some of the infrastructure/business services needed to accommodate a shellfish aquaculture industry. Shellfish markets are generally healthy, so production should be easily absorbed.

The question remains, then: "How can the way be paved to encourage siting of shellfish aquaculture operations in the NIS Study Area? (ie, what are the barriers and constraints?)".

The production-oriented approach to exploiting a shellfish aquaculture opportunity such as the one presented in the Study Area would be to follow these steps.

1. Identify target specie(s).
2. Identify sites with best potential.
3. Obtain tenure rights to sites.
4. Secure financing to commence operations.
5. Ensure trained/qualified personnel to run the operation.
6. Establish farm operation – seed, grow, harvest.
7. Secure processor to purchase/market product.

To test the validity of the production opportunity, in the remainder of this section we examine the following Barriers & Constraints relevant to shellfish aquaculture development in the region:

- Biophysical Attributes
- Regulatory
- Financial/Capital
- Human Resources
- Operational
- Transportation
- Processing/Marketing
- Intra-Regional Linkages

Biophysical Attributes

The NIS Coastal Plan identified that there are considerable grounds with good shellfish aquaculture potential in the NIS Study area: about 28,500 ha of oyster, and 15,500 ha of scallop rearing area were identified in survey work.

Biophysical attributes include such things as:

1. Suitable growing characteristics.
2. Inter-tidal and sub-tidal conditions.
3. Tides.
4. Water quality.
5. Water temperature.
6. Air temperature.
7. Exposure to wind.
8. Biotoxins (eg, red tides).
9. Chemical issues (eg, oil spills).
10. Fresh water run-off.

Barriers & Constraints

We have identified the following Barriers & Constraints with respect to biophysical attributes in the NIS Study Area.

1. Specific attributes of potential sites are unknown (eg, how the effects of tide, wind, exposure and temperature, severity of red tides and timing/duration of red-tide closures) and are likely to affect culture operations for various species).
2. There is a "learning curve" associated with every site as the operator becomes familiar with local conditions.
3. Productivities, yields and such vary with the experience and knowledge of operators and biophysical parameters vary across sites.

While surveys have identified shellfish aquaculture grounds in the NIS Study Area as having good potential, it is unconfirmed until proven up. Any "greenfield" operation faces start-up uncertainties.

Opportunities

One way to reduce the risks identified above would be to start with pilot or small scale operations to confirm positive biophysical attributes at selected sites and gain insight into expected growth rates and yields.

Governments have in the past granted subsidies for first entrants as a reward for generating "intelligence" to benefit those who follow.

Regulatory

Shellfish aquaculture proponents in the NIS Study Area are already familiar with lengthy delays in the process of securing tenures for shellfish aquaculture. One participant in the Barriers & Constraints Study Information Workshop reported that he has been attempting to obtain tenure for the past eight years.

The Regional District of Mount Waddington reports that recent experience indicates a minimum of three years to secure a shellfish tenure, with an average wait of 3-6 years. They hope that, with the new mandate for the Ministry of Water, Land and Air Protection, this waiting period will be reduced to less than three years. Their goal for Shellfish Development Areas is to reduce the waiting period to less than one year.

Barriers & Constraints

1. The tenure process is extremely slow, expensive, and frustrating for applicants. Entrepreneurial spirit may erode over time as tenure hold-ups stifle business start-ups.
2. Various levels of government compound the problem (eg, Agriculture, Food and Fisheries BC, Water and Land BC, Fisheries and Oceans Canada and Transport Canada (Navigable Waters)).
3. Currently, there are no facilities for water quality testing.

Opportunities

1. The Economic Development Office of the Regional District has developed a plan to pre-approve a suite of "Shellfish Development Areas" that it would then make available to prospective shellfish aquaculture developers. If regional government can pave the way for prospective shellfish entrants, a formidable barrier to initiating shellfish aquaculture may be surmounted.

Financial/Capital

At best, shellfish aquaculture can be seen as a low-risk activity compared to wild capture-based businesses. The following factors contribute to the relatively low risk of shellfish aquaculture.

- Key inputs can be controlled (eg, seed supply from hatchery).
- The amount of product that can be supplied is reasonably predictable.
- Product can be harvested throughout the year.
- Shellfish aquaculture is not reliant on cyclical volatile stocks.
- Careful husbandry reduces risks from predation.

A business with these stable characteristics may have reasonable prospects of attracting sufficient financing.

Conversely, the profile of an investment in shellfish aquaculture in the NIS Study Area would likely be viewed as high risk. The following factors contribute to this high risk assessment.

- The NIS Study Area is a new and untried area for shellfish aquaculture. Biophysical issues at sites (eg, water temperature and flow, fresh water run-off, weather, exposure, ice) will only be understood over time.
- Shellfish farm sites tend to have "unique" production characteristics.
- Grow-out and survival rates are unknown.
- The effects of weather and predators are uncertain.
- Production would possibly involve developmental species.
- The nature of a start-up shellfish aquaculture investment implies heavy up-front costs with no revenue stream for at least two years.
- Commodity markets can change overnight, let alone in two-plus years.
- There is an operating cost disadvantage relative to more centrally-located shellfish producers.

The factors listed above imply an investment profile that would likely be characterized as "speculative". Furthermore, in terms of investor-lender security, the primary asset would be unharvested product which is uncertain in quantity, quality and value. This profile is inconsistent with the conservative lending criteria of conventional lenders such as banks and credit unions. In our estimation, no bank or credit union would fund a venture lacking positive cash flow and tangible security.

These factors help to explain why existing shellfish growers are chronically under-capitalized and often have to operate without sufficient working capital.

The ability of a prospective shellfish aquaculture operation in the NIS Study Area to obtain suitable and adequate financing would depend on its ability to sell its business plan as one possessing the characteristics of a low-risk activity rather than a high-risk one.

The nature of a start-up shellfish aquaculture operation (ie, up-front investment, ongoing husbandry costs, two-plus year grow-out period prior to first revenue) implies the need for a healthy component of equity capital because debt cannot be serviced in the short-term. Use of debt as a major component of capital structure is a non-starter.

A necessary first-step to securing financing from any source for a prospective shellfish aquaculture operation in the NIS Study Area is a business plan that suits the risk, return, and timeframe profiles of potential investors.

Barriers & Constraints

The key Barriers & Constraints with regard to financial capital are listed below.

1. The nature of shellfish aquaculture – upfront and ongoing investment, no cash flow for 2+ years.
2. There is no ability to service debt until the first "crop" is harvested.
3. There are substantial operating and market risks – uncertain yields, volumes, and values.
4. Security is problematic.
5. Shellfish aquaculture is necessarily a speculative enterprise for the first few years.
6. Lending institutions are averse to seafood projects in general, and speculative seafood initiatives lacking conventional security in particular.
7. All of the above point to a large equity investment.

Opportunities

1. Expansion/re-location of an existing operator would be less risky than a start-up by a new operator, either:
    a. establishment of a new shellfish aquaculture operation by an operator based elsewhere, or
    b. diversification into shellfish by a finish aquaculture operator (existing tenure, incremental activity).

2. Business strategies to shorten the lag between investment and returns would improve the profile of a venture, for example:
    a. Combining initial wild harvest with subsequent culture harvest (clams) where possible.
    b. Engaging in product "trading' (brokerage, commission sales) to provide positive cash flow while gaining sales and marketing acumen.

Human Resources

Human resources for shellfish aquaculture in the NIS Study Area can be considered in three parts.

1. Entrepreneurs.
2. Farm operations staff.
3. Processing operations staff.

We consider training issues at the end of this section.

Entrepreneurs

Fundamental to establishing a successful business is an entrepreneur: that is, someone who assumes the risks of a business or enterprise, plans its inception and organizes and manages its operation.

The North Island Straits clearly possesses numerous resourceful individuals who have forged successful and diverse businesses. Yet, in our discussions to date we have identified only a handful of individuals with a passion to initiate shellfish aquaculture businesses.

Perhaps one of the most significant barriers and constraints to development of shellfish aquaculture in the NIS Study Area is the lack of widespread local passion to initiate this kind of business.

Entrepreneurial drive may easily be dulled by the regulatory hurdles faced by would-be shellfish farmers in their efforts to secure tenures.

The drive to bring shellfish aquaculture to the NIS Study Area appears to be driven more by the strategic initiatives of government (ie, the identification in the NIS Coastal Plan of sites in the Study Area suitable for shellfish aquaculture and the clear and significant need for local economic development) than a grass-roots passion for the business.

Barriers & Constraints

1. There appear to be few individuals/small businesses in the NIS Study Area with a passion to enter the business.
2. Shellfish farming is typically labour intensive and returns are modest. This suggests that a shellfish aquaculture investment may equate to buying oneself a job.
3. Few individuals/small businesses have the wherewithal to fund a start-up farm.

Opportunities

1. Expansion/re-location of existing operators may provide the push necessary to initiate shellfish aquaculture in the Study Area.
2. NIS salmon farmers may facilitate development of shellfish aquaculture in the Study Area by incorporating it into their existing operations, perhaps with an extension/enlargement of their lease (rather than having to a acquire a new tenure).
3. Shellfish farming may be a good fit for ex-fishermen or under-employed fishermen given their skills, assets, lifestyles and expected incomes.

Farm Operations Crew

There is reasonably high unemployment in the North Island Straits Study Area and nearby areas, much of it the result of recently displaced workers from forestry and the wild fishery. These workers are likely to have transferable skills (eg. knowing how to operate a vessel and gear, knowledge of the coast) and life-style expectations that are consistent with work in shellfish aquaculture operations.

Given that the inventory of potentially suitable shellfish aquaculture farm sites implies that opportunities will be in isolated, remote locations typically 50-80 kms from Port McNeil or Port Hardy, and that overall returns to labour in shellfish aquaculture are modest, it is not clear that there are many individuals in the NIS Study Area with a keen interest in staffing shellfish farms.

Barriers & Constraints

1. Potential farm sites tend to be well-removed from population centers implying travel time via small vessels.

2. Wages may be modest when compared to traditional fishing, forestry, and mining wage levels.
3. Year-round farm jobs may conflict with other seasonal activities.
4. Most NIS Study Area residents lack direct shellfish aquaculture experience.

Opportunities

1. There is a strong need for economic development and jobs which is recognized by local and higher levels of government.
2. Many un-employed or under-employed persons have highly transferable skills.

Processing Operations Staff

From the recent growth of processing in the NIS Study Area, it is evident that plant work forces are flexible and can easily accommodate new activities related to processing production from shellfish aquaculture.

Training

Malaspina College, North Island College and BCIT, in conjunction with the BCSGA, have demonstrated their ability to develop and deliver programs and courses providing the training and education required to implement and support (ie, shellfish processing) shellfish aquaculture in the NIS Study Area. Individually, collectively or in some combination, these institutions have the capability to deliver the required training.

Barriers & Constraints

1. Few residents of the NIS Study Area are currently trained in shellfish husbandry practices.
2. Few plant employees are currently skilled in shellfish-handling.
3. Broader business skills are also a pre-requisite.
4. Much of the required knowledge base derives from "working the grounds" and cannot be gained in the classroom.

Opportunities

1. Collectively, Malaspina College and North Island College (perhaps in conjunction with BCIT and the BC Shellfish Growers Association) are capable of deliver-

ing specific training programs for both husbandry and processing functions.

Shellfish Aquaculture Operations

There are currently no shellfish aquaculture operations in the NIS Study Area that are growing shellfish and profitably selling them into seafood markets.

There is an experimental abalone farm at Sointula on Malcolm Island: the Malcolm Island Shellfish Cooperative. They are currently growing out abalone but to date have not sold any product commercially.

Barriers & Constraints

1. The learning curve associated with greenfield operations (eg, survival rates, grow-out rates, lack of trained staff) create an initial competitive disadvantage relative to established operators.
2. Productivity of the grounds in the NIS Study Area is unproven.
3. Remoteness means some level of ongoing cost disadvantage (eg, higher costs to bring-in supplies and labour and to ship out finished product) for shellfish aquaculture operations in the NIS Study Area.

Opportunities

1. Non-traditional species may be possible where biophysical characteristics of the NIS Study Area prove advantageous.
2. With a large apparent inventory of suitable shellfish aquaculture acreage in the region, the potential exists to establish larger farms in the NIS Study Area, compared to established areas. A greater operating area, may offset possible yield disadvantages.

Transportation

With Englewood Packing Company processing approximately 30 million pounds of farmed salmon annually and Pan Fish producing a similar amount, coupled with several million pounds per year unloaded by Cove Fish, Bornstein's and others, transportation infrastructure for trucking fresh and frozen seafood from the NIS Study Area to mainland markets is well-established.

There is a minor incremental cost that would be borne by North Island Straits shellfish aquaculture producers compared to producers located in central Vancouver Island. We estimate this cost to be 3-4 cents per finished pound of product (assuming full truck loads). Such a premium would also apply to supply inputs for aquaculture operations.

Looking at the markets that are out there right now and the way that the food industry is moving, the North Island has a lot of catching up to do before value added seafood is the backbone of the local fishing industry. On the other hand, ***situated, as we are, on the West Coast, with excellent transportation networks serving North America and beyond****, there are amazing opportunities for innovative seafood producers.*

- Bill Shephard

The impact of this incremental cost is highly dependent on the value of products being transported. Where economics are marginal, as in whole oyster production, this cost, even though small, could be a significant barrier.

Barriers & Constraints

1. NIS Study Area operations would bear additional trucking costs compared to mid or south Island operations.
2. Incremental transport costs apply to both supplies/inputs and shipping of finished product.

Opportunities

1. Availability of trucks to transport supplies and finished product is not an issue. The area is already a hub of activity for offloaded wild seafood and processed farmed salmon.

Processing/Marketing

Keltic Seafoods and Port Hardy Cold Storage are the only existing plants with an interest in processing cultured shellfish.

Full Processors
Keltic Seafoods
Englewood
Alpha & Omega
Port Hardy Cold Storage

Unloading Operations
Cove Fisheries
Canfisco
Bornstein
North Seas

Keltic Seafoods is currently temporarily fully utilised as they accommodate throughput for Alpha & Omega Seafoods. This situation will be resolved long before shellfish aquaculture production comes on line.

Keltic is willing to implement a shellfish Quality Management Program to

accommodate and support shellfish growing operations if and as they develop in the Study Area.

Management at Port Hardy Cold Storage has expressed an exploratory interest in providing custom cold storage services to local area businesses. Until recently, their cold storage capacity has been for the exclusive use of their parent company, Alpha & Omega Seafoods.

Cove Fish has the space to accommodate shellfish processing and are looking for processing opportunities to complement their current unloading business.

If the chosen product form were whole oysters, processing requirements would be rudimentary. Local plants could easily accommodate initial production.

There is sufficient processing capacity in the Study Area to accommodate "start-up" volumes of shellfish aquaculture production. Additional processing capacity could be mobilized in reasonably short order if and as the need arises.

Keltic Seafoods is purely a custom processor which neither purchases product from producers nor sells finished product into markets. Keltic will not provide a market for local shellfish aquaculture production, merely a processing avenue.

We have learned anecdotally that Stolt Seafarms (Sterling Product Line), a major farmed salmon producer in the region, is interested in marketing North Island shellfish.

Barriers & Constraints

1. There are currently no major processors in the NIS Study Area engaged in the shellfish aquaculture business.
2. No firms canvassed (Keltic, Alpha & Omega, Englewood) have an immediate interest in taking a position in shellfish processing/marketing.
3. Some processors in other locations are reported to be reluctant to take on new (and even existing) production.

Opportunities

1. Keltic Seafoods is interested in custom processing shellfish and is willing to invest in certification and employee training.

2. Alpha & Omega may have surplus cold storage space becoming available that could accommodate small start-up volumes of shellfish aquaculture product.
3. Unloading operations such as Cove Fish are seeking expansion/diversification opportunities.
4. There is strong likelihood that shellfish production could be handled, if not marketed, by local firms.
5. Stolt Seafarms, a major global seafood player, has apparently expressed an interest in marketing locally produced shellfish.

Intra-Regional Linkages

Quatsino Sound has had an ongoing shellfish aquaculture development initiative: beaches and deep water sites have been approved. Quatsino Sound therefore has the potential to produce shellfish before the NIS Study Area.

If and as Quatsino Sound shellfish production comes on line, there will be an opportunity for NIS Study Area processing assets to be utilized.

If and as NIS shellfish aquaculture production comes on line, there will be opportunities to generate efficiencies, combine product offerings and generally work together with NIS Study Area interests to improve product consistency and variety, and the level of service to customers.

Summary of Barriers & Constraints and Opportunities

Our findings on Barriers and Constraints to, and Opportunities for, shellfish aquaculture development in the North Island Straits Study Area are summarised in the following table.

Item	Barriers & Constraints	Opportunities
Biophysical Attributes	Specific attributes of potential sites are unknown (eg, tide, wind, exposure, temperature). There is a "learning curve" associated with every site, as the operator becomes familiar with local conditions. Productivities, yields and such vary with the experience and knowledge of operators and biophysical parameters vary across sites.	One way to reduce the risks identified above would be to start with pilot or small scale operations to confirm positive biophysical attributes at selected sites and gain insight into expected growth rates and yields. Governments have in the past granted subsidies for first entrants as a reward for generating "intelligence" to benefit those who follow.

Item	Barriers & Constraints	Opportunities
Regulatory	The tenure process is extremely slow, expensive, and frustrating for applicants. For some, inability to secure tenure is a "deal-breaker"; it saps the entrepreneurial spirit. Various levels of government compound the problem (eg, Agriculture, Food and Fisheries BC, Water and Land BC, Fisheries and Oceans Canada and Transport Canada (Navigable Waters)). Currently, there are no facilities for water quality testing.	The Economic Development Office of the Regional District has developed a plan to pre-approve a suite of "Shellfish Development Areas" that it would make available to prospective shellfish aquaculture developers. Implementing this plan requires the co-operation at a minimum of the agencies cited above.
Financial/Capital	Nature of shellfish aquaculture – upfront and ongoing investment, no cash flow for 2+ years. No ability to service debt until first "crop" harvested. Substantial risk – uncertain yields, volumes, and values. Security problematic. A speculative enterprise for first few years. Points to large equity investment.	Expansion/re-location of an existing operator would be less risky than a start-up by a new operator. Business strategies to shorten the lag between investment and returns would improve the profile of a venture.
Human Resources—Entrepreneurs	There appear to be few individuals/small businesses in the NIS Study Area with a passion to enter the business. Shellfish farming is typically labor intensive and returns are modest. This suggests that a shellfish aquaculture investment may equate to "buying yourself a job". Few individuals/small businesses have the wherewithal to fund a start-up farm.	Expansion/re-location of existing operators may provide the "push". Shellfish farming may be a good fit for ex-fishermen or under-employed fishermen given their skills, assets, lifestyles and expected incomes.

Item	Barriers & Constraints	Opportunities
Human Resources—Farm Operations Crew	Potential farm sites tend to be well-removed from population centers implying travel time via small vessels. Wages may be modest when compared to traditional fishing, forestry, and mining wage levels. Year-round farm jobs may conflict with other seasonal activities. NIS Study Area residents lack direct shellfish aquaculture experience.	The area currently suffers from high unemployment. Many un-employed or under-employed persons have highly transferable skills.
Human Resources—Training	Few residents of the NIS Study Area are currently trained in shellfish husbandry practices. Few plant employees are currently skilled in shellfish-handling. Broader business skills are also a pre-requisite. Much of the required knowledge base derives from "working the grounds" and cannot be gained in the classroom.	Collectively, Malaspina College and North Island College (perhaps in conjunction with BCIT and the BC Shellfish Growers Association) are capable of delivering specific training programs for both husbandry and processing functions.
Shellfish Aquaculture Operations	The learning curve associated with greenfield operations (ie, survival rates, grow-out rates, lack of trained staff) create an initial competitive disadvantage relative to established operators. Productivity of the grounds in the NIS Study Area is uncertain. Remoteness (ie, higher costs to bring-in supplies and labour and to ship out finished product) means some level of ongoing cost disadvantage for shellfish aquaculture operations in the NIS Study Area.	Explore non-traditional species where biophysical characteristics of the NIS Study Area may prove advantageous. The potential for larger farms in the NIS Study Area, compared to established areas, may offset possible yield disadvantages.
Transportation	North Island Straits operations will bear additional trucking costs compared to mid or south Island operations. Incremental transport costs apply to both supplies/inputs and shipping of finished product.	Availability of trucks to transport supplies and finished product is not an issue. The area is already a hub of activity for offloaded wild seafood and processed farmed salmon.

Item	Barriers & Constraints	Opportunities
Processing/Marketing	There are currently no major processors in the NIS Study Area engaged in the shellfish aquaculture business. No firms canvassed (Keltic, Alpha & Omega, Englewood) have an immediate interest in taking a position in shellfish processing/marketing. Some processors in other locations are reported to be reluctant to take on new (and even existing) production.	Keltic Seafoods is interested in custom processing shellfish and is willing to invest in Certification and employee training. Alpha & Omega may have surplus cold storage space becoming available that could accommodate small start-up volumes of shellfish aquaculture product. Unloading operations such as Cove Fish are seeking expansion/diversification opportunities. There is strong likelihood that shellfish production could be handled, if not marketed, by local firms.

Assessment of North Island Straits Shellfish Aquaculture Opportunity from the Production Perspective

The following conclusions can be drawn by weighing barriers & constraints against opportunities.

- Production of shellfish in the NIS Study Area is realistic. Biophysical attributes are likely to be attractive and much of the required infrastructure is in place.
- NIS Study Area producers would face the risks associated with business start-ups (eg. uncertain site attributes, grow-out rates & yields, new personnel).
- NIS Study Area farm operations would operate at an ongoing marginal cost disadvantage compared to mid/south Island farms (eg, extra 3-4 cents/lb trucking on finished product).
- Physical infrastructure and human resources not currently present could be developed.
- Marketing of production poses daunting challenges.

From a production perspective, the NIS Study Area is well-suited to development of shellfish aquaculture. The barriers & constraints considered so far are not insurmountable.

The ability to produce shellfish, however, does not necessarily translate into profitable operations. Only profitable shellfish operations will generate sustainable economic development and employment for the region.

Pitfalls of the Production Perspective

There is nothing inherently wrong with the Production Perspective. There *is* potential peril if the foundation of one's shellfish aquaculture opportunity is access to a given piece of beach or water column, and if the balance of one's business plan is meant to justify development of such sites.

The pitfalls of the Production Perspective can be summarised in the following statements.

1. Business strategy is based on identifying sites with the potential to grow shellfish.
2. Business plans may be premised only on production opportunities.
3. Market research is limited to information supporting production plans (eg, decide what you want to grow, then find literature to support these plans).
4. Marketing plan is limited to selling product to a processor, therefore producer lacks security and influence over revenues; marketing may be an act of faith...*someone will buy my production when it comes on-stream.*
5. Weak marketing plan means uncertain revenue prospects, which elevates the risk of the venture.
6. Capital is difficult to raise for risky ventures.
7. Skimpy funding and no marketing influence brings marginal financial results.
8. Marginal finances imply limited benefits and growth.

Rationale for a Market-Driven Approach

The shellfish aquaculture development opportunity available to the North Island Straits could be described from a market-driven perspective as follows:

World demand for seafood in general, and shellfish in particular, is strong and growing. The BC shellfish industry is, however, diminutive in the scheme of the global shellfish business. BC is dwarfed by Asian and European producers, and therefore lacks significant market influence. In order to secure a profitable place in the shellfish industry, BC players must work "smart", by differentiating and value-adding high-volume commodity products, or supplying primary products which are in scarce supply in the marketplace. By servicing customers in fundamentally attractive markets or market segments, growth and profitability prospects are enhanced. The North Island Straits Region possesses sites, people, and infrastructure with potential to serve attractive shellfish markets.

Effectively, launching a business (or an industry) from a market perspective requires a high level of due diligence at the research and planning stages. While this up-front due diligence may result in some apparent opportunities being rejected (because the economics do not work out), it should ultimately result in a stronger, more sustainable enterprise (or industry).

In the next section we explore the implications of applying a market-driven approach to shellfish aquaculture development in the NIS Study Area.

The Market-Driven Approach

Possible steps to applying a market-driven approach to North Island Straits shellfish aquaculture development can be summarized as follows.

1. Begin with objective market research and analysis – where are legitimate market opportunities?
2. Devise a marketing plan to exploit identified opportunities.
   a. Marketing plan includes products, target markets, distribution strategies, pricing, branding, promotion.
   b. The outcome of a marketing plan should be a revenue forecast based on projected sales volumes and prices
3. Tailor a production plan to fulfill the marketing plan (source production needed to supply forecast selling volumes).
   a. Identify sources of production.
   b. Estimate cost of production.
   c. Evaluate associated administration, sales and overhead costs.
4. Assess capital requirements to fund the venture.
5. Confirm viability through conservative financial projections.
6. Secure financing, based on a sound market, production, and financial plan.

The elements of a market-driven approach, as they may apply to the North Island Straits Study Area, are considered in turn.

Market Research

A potential entrant to shellfish aquaculture in the NIS Study Area must understand the scope and nature of the world shellfish industry and how the BC industry generally, and a North

Island Straits venture specifically, would fit into the "big picture".

The first step for a potential entrant would be to focus on the business under consideration. The likely candidates for BC shellfish are: oysters, clams, mussels, scallops and other species currently being developed (eg, abalone, geoduck).

To gain a big picture understanding, the potential entrant must consider a range of factors.

- Major producing areas by species.
- Major consumption areas by species.
- Key product forms.
- Price levels for key product forms.
- Current and expected distribution channels.
- Production, product and price trends.

Objective market information sources should be cited where possible.

Shellfish production is a world-wide industry with world-wide markets. North American oyster production is worth about $80 million. BC accounts for roughly 5% of North American production and 0.1% of world production.

- Blair Salter

... while all information sources indicate that potential new markets do exist for BC shellfish, many of those opportunities require a much larger critical mass in order to successfully supply on a consistent, year-round basis.

- Brian Kingzett

British Columbia's currently minor role in world-wide shellfish aquaculture production has been interpreted as evidence that we enjoy almost unlimited upside: a vision of enormous growth has been promulgated within the past few years. We believe that great care must be taken in interpreting global shellfish aquaculture statistics: if BC is an infinitesimal producer in a huge market, this does not in our opinion bode well for a small BC producer with a high cost base who will necessarily have to accept commodity pricing with no influence on the market.

We offer the following brief analysis to highlight how similar market research data may be interpreted according to one's perspective:

Market Information	Optimistic View	Pragmatic View
BC is only 0.1% of global oyster production	We therefore enjoy tremendous growth potential... small increases in share translate into huge volumes.	We likely have a higher cost base than large-scale producers and will be forced to accept prevailing commodity prices. Competitors will not yield market share willingly.
BC's current level of supply is too small to service certain substantial customers and markets.	By dramatically increasing our production, we will be able to open-up these markets.	Increasing supply before customers are secured implies a high level of financial risk for producers.

We have identified three examples of opportunities that we think would flow from a realistic market analysis.

1. Produce a commodity product that can be *differentiated* in the market place thereby avoiding the need to compete on price and volume against formidable competition (eg, branded BC oysters).
2. Produce a commodity product and sell it into value-added product markets to achieve premium prices and margins over commodity levels (eg, oysters Rockefeller, frozen, half-shell oysters).
3. Produce a commodity product of a species for which world price levels remain high and where expected supply-demand dynamics are expected to allow prices to remain high (eg, scallops and manila clams).

Marketing Plan

With market research having identified legitimate and promising opportunities to serve attractive markets, the next step is to devise a practical and realistic marketing plan.

Such a plan would include consideration of:

- Target markets.
- Branding.
- Sales pricing.
- Marketing program.
  - Advertising.
  - Promotion.
  - Packaging.
- Penetration strategies (eg, broker, in-house sales).

- Species.
- Harvest volumes and timing.
- Transportation.

A key decision for a potential NIS shellfish aquaculture entrant is whether to take responsibility for its own sales and marketing, or simply sell to an existing processor. In either event, the shellfish farmer must carefully consider the above variables.

The days of shellfish farmers growing what they want and then looking for a buyer once the product becomes harvestable are over

- Brian Kingzett.

The risks and rewards arising from either marketing strategy must be carefully weighed. Too often in the shellfish industry a grower grows his chosen species and takes it on faith that his processor will accept volumes and qualities, and pay prices, that will allow profitable operations.

Shellfish producers who opt to market their own production would face greater up-front challenges but would ultimately enjoy greater security, autonomy and growth potential.

A subtle but vital component of the market-driven approach is that, if and once the steps outlined in this and the preceding section—market research and marketing plan—are completed, the elements of a viable business are already in place. A modern business does not necessarily need to produce its own finished product.

In the recent past, BC supply has been only a fraction of demand and processors have been able to sell all they could source. However, industry is now in a major transition period. Provincial and North American production of oysters has increased, creating soft markets and making it apparent that traditional market channels need to be expanded and new channels developed.

- Brian Kingzett

With the current reluctance of processors to accept existing production, expanding BC production would inevitably lead to a marketing bottleneck. A business plan that can alleviate the marketing bottleneck would add value to the industry and enjoy substantial opportunities for profit and growth.

Such a marketing-based business could also take advantage of other seafood products experiencing similar challenges (eg, pink and chum salmon).

From a business planning perspective, the outcome of a marketing plan is a revenue forecast in which selling volumes and values are forecast. This key schedule provides the basis for operational planning.

The "correct" scale of a shellfish aquaculture operation should be dictated by the sales volume forecast, not by production capability, the desired scope of the operation, or capital avail-

ability (ie, the amount of money government is willing to invest).

Shellfish Farm Economics

With selling volumes and values forecast in the marketing plan, the next step is to forecast production costs (ie, cost of goods sold). The difference between revenue and cost of goods sold is gross margin.

The following are among the costs to be quantified.

- Seed purchases.
- Feed (if required).
- Nursery operations (if required).
- Labour costs.
- Supplies.
- Regulatory monitoring and compliance costs.
- Other operating costs (eg, fuel, vehicle and vessel operations).

Integral to reasonable cost assessment (particularly unit costs) are assumptions about rates and other important parameters, including the following.

- Survival rates.
- Grow-out times.
- Size at market.
- Yield per hectare.

The above rate estimates have an enormous impact on cost so it is critical that well-reasoned, conservative assumptions be applied. For the NIS Study Area, essentially a greenfield operation, business planning should assume lower survival rates, longer grow-out times, smaller size at market and lower yield per hectare than "industry standards". Sensitivity analysis will reveal how important these assumptions are to business prospects.

The Marketing Plan SWOT analysis concluded:

Growers in BC suffer from lack of demand for their product from processors.

New investment in farm operations (only) would not be supported by a strong business case.

Few existing processors have strong marketing relationships and access to export markets.

Current processors lack critical mass for major export markets.

- Blair Salter

By combining industry standard cost estimates with conservative rate estimates befitting a greenfield NIS Study Area shellfish aquaculture operation, the costs of producing farmed shellfish volumes indicated in the marketing plan can be derived. Deducting cost of

production from forecast sales revenue yields a forecast of gross margin.

As mentioned above, a shellfish sourcing strategy need not be solely based on "in-house" farm production. Product can be sourced from other farms, or in the commodity marketplace.

Business Overhead

The level of gross margin is used in part to define the level of overhead and administration costs that can be borne by the operation.

The following are examples of business overhead and administration costs.

- Costs of procuring and maintaining tenures.
- Land tenure fees.
- Site development.
- Administrative and management salaries.
- Sales and marketing expenditures.
- Office and telephone.
- Insurance.
- Building and float maintenance.
- Power.
- Depreciation.
- Taxes.
- Interest.

As with production costs, realistic estimates are important to keep the potential of the business in proportion. For any business to survive, it is critical to keep overhead costs in check. For a shellfish aquaculture venture, potentially impacted by shifts in commodity price levels and variations in actual vs expected production volumes, which lead to large swings in gross margin levels, it is even more important.

Subtracting overhead and administration expenses from gross margin leaves a forecast of operating income.

Capitalization

All of the above analysis leads ultimately to the question of capitalization.

Capitalization involves two issues:

- **Capital Requirement**: how much money is needed.
- **Capital Structure**: source and application of funds.

Capital requirement is the sum of start-up capital and working capital.

Capital structure is the combination of sources of funds used to get the business off the ground.

Shellfish Farm Economics dictate what capital assets will be required. These include:

- Site planning and preparation.
- Buildings.
- Floats.
- Vessels.
- Nets, lines, anchors.
- Generators.
- Winches.

Accurate, conservative estimates of these costs are required to determine start-up funding requirement. The level of operating income strongly influences the level of capital investment that can be supported by the venture.

With market, operations, administration and capital elements defined and evaluated, the final step is to procure funding to support the venture.

Assessment of North Island Straits Shellfish Aquaculture Opportunity from a Market Perspective

Adopting a market-driven approach to shellfish aquaculture does not in itself bring new barriers and constraints to the prior analysis.

Approaching shellfish business development from an objective market perspective has two implications for the North Island Straits.

1. Some seemingly promising ideas may be "filtered out" as they fail to meet the required level of due diligence.
2. Sales and marketing activities (without regard to production) can provide opportunities for North Island Straits entrepreneurs.

With full access to modern telecommunications and fast internet connections, coupled with access to efficient transportation, North Island Straits residents are positioned to engage in meaningful marketing activities.

Summary & Conclusions

From a production perspective, there are a number of barriers and constraints to North Island Straits shellfish aquaculture development.

- The tenure process.
- The apparent lack of entrepreneurs wishing to enter the business.
- Uncertainty about specific attributes of sites (indicating a learning-curve).
- Ongoing marginal cost disadvantage associated with location.
- Lack of finished product marketing capacity.

For NIS Study Area-based shellfish aquaculture operations, these barriers and constraints raise the following implications.

- It will be riskier than the "average" shellfish aquaculture operation.
- It will be difficult for "ma & pa" operations to set-up and compete – such operations will face operating cost disadvantages compared to larger producers, and prospects for raising funds are poor.
- Would-be North Island Straits operators must "work smart"... identifying and exploiting legitimate market opportunities.

Working smart implies growing to market demand and providing value to customers. Marketing capacity is key: this critical function must not be left to chance; it should be the foundation of a North Island Straits shellfish aquaculture business plan.

In our estimation, the North Island Straits Region possesses the physical and human resource attributes to become, over time and with appropriate investment and training, a legitimate producer of shellfish aquaculture products. It would in our opinion be a mistake, however, to proceed with large scale shellfish aquaculture development without prior consideration of market factors. Development of shellfish *marketing capacity* within the North Island Straits would go a long way to ensuring that the region maintains control of its shellfish aquaculture destiny.

Acknowledgements

We wish to acknowledge the Ministry of Sustainable Resource Management and the Ministry of Agriculture, Food and Fisher-

ies and for funding this project and providing ongoing guidance and assistance.

We also thank Annemarie Koch of the Mount Waddington Regional District for her valuable input and assistance in facilitating meetings and the information workshop.

We appreciate the input of all who participated in this study.

Appendix A: Study Area Background

The North Island Straits (NIS) Coastal Study Area is situated on Canada's Pacific coast between Vancouver Island and the mainland of British Columbia. The NIS Study Area includes the foreshore and near shore areas of Vancouver Island, the mainland coast and the associated islands and islets from Port Neville in Johnstone Strait to Cape Caution in the Queen Charlotte Strait. It extends approximately 138 km from east to west, encompassing some 560,000 ha of marine waters.

Figure 1: North Island Straits Study Area

The NIS coastal Study Area contains a local population of about 15,000 residents. The largest communities are Port Hardy and Port McNeill on Vancouver Island's northeast coast.

The majority of the Study Area's 15,000 population lives on Vancouver Island at Port Hardy (now including Fort Rupert) and Port McNeill. Smaller permanent and seasonal communities include Sointula (Malcolm Island), Alert Bay (Cormorant Island), Hyde Creek, Telegraph Cove, and Echo Bay. A number of First Nations communities are also located on adjacent islands. These communities and their relative populations are shown on the following map.

Figure 2: Study Area Population Centres

Community Infrastructure and Services

Most of the public and commercial infrastructure serving the NIS Study Area is located in Port Hardy and Port McNeill, with limited services available elsewhere.

Port Hardy, with a population of almost 5,300 (including nearby Indian Reserves), is the regional centre for the area, with the bulk of accommodation, health, education, government services, retail outlets and other commercial services in the NIS area. It also has a commercial harbour, two marinas, and related marine services. It is the location of the north and central coast BC Ferry terminal.

Port McNeill is the second largest community in the NIS area, with a population of about 2,800. It includes a range of commercial accommodation, health and education services, and has a harbour providing commercial and recreational moorage and related marine services. A BC Ferry terminal links the community to Sointula and Alert Bay.

Alert Bay on Cormorant Island, has a population of almost 1,300, including adjacent First Nations communities which account for over half of the population. The Alert Bay area provides a number of accommodation facilities, several retail outlets, moorage and related marine services.

The small communities of Sointula and Telegraph Cove also provide some limited infrastructure and services. Sointula is primarily oriented to the fishing industry, and the Telegraph Cove area has important industrial activities as well as serving as a service and staging centre for marine based tourism.

First Nations in the Study Area are listed in the following table.

Location	Nation	Est. 1998 Population
Kingcome	Tsawataineuk	172
Gilford Island	Kwicksutaineuk	235
Hopetown	Kwa-Wa-Aineuk	27
New Vancouver	Da'naxda'xw	n/a
Hope Island	Tlatlasikwala	41
Port Hardy	Gwa'Sala-Nakwaxda'xw	595
Port Hardy	Kwakiutl	591
Village Island	Mamaleleqala-Qwe'Qua'Sot-Enox	228
Alert Bay	Namgis	1,406
Alert Bay	Tlowitsis-Mumtagila	317
Total		3,612

Source: CCLCRMP Socio-Economic Base Case, Ministry of Employment and Investment, 2000,based on data from Indian and Northern Affairs Canada 1998.

Aquaculture

There are 41 finfish tenures in the Study Area, all for salmon farming. A large cluster of operations in the Broughton Archipelago area is among the largest in the province. A second group of operations lies in an arc across the entrance to Queen Charlotte Strait from Port Hardy to the mainland coast. The high number of finfish production facilities is related to biological and oceanographic conditions. Finfish aquaculture sites generally require sufficient depth and current flow, high water quality and locations sheltered from high wind and storm events.

The provincial government has siting criteria in place that address other conditions and potential conflicts, such as distance from shellfish beds, predators and migratory birds. Finfish farms usually require associated on-water structures for housing and storage.

Although the Study Area has favourable biological and oceanographic conditions for beach and off bottom shellfish culture, there has been little interest or activity for this type of aquaculture. The NIS contains 2 (this number needs to be verified) shellfish tenures, at Broughton Lagoon and Harbledown Island. Shellfish production sites usually require adjacent upland or floating structures.

28,500 ha of good oyster, and 15,500 ha of good scallop potential in the NIS area.

There is significant biophysical potential for aquaculture expansion in the NIS area. Data provided by MSRM indicate there are about 3,600 hectares of good finfish, 28,500 ha of good oyster, and 15,500 ha of good scallop potential in the NIS area. It is likely that the number of aquaculture sites may increase, although resource conflicts and other factors will limit expansion.

Aquaculture offers significant employment potential for First Nations. Due to economies of scale and technological change, employment growth will not likely keep pace with increases in the number of sites.

Transportation Access and Infrastructure

Transportation access is a key factor shaping the pattern of human settlement and the economy of the NIS area. The Study Area lies well beyond the province's main population centres and markets in southwest BC. The NIS communities on Vancouver Island are accessible, by Highway 19 to southern Vancouver Island, while the mainland side of the NIS, and the Broughton Archipelago islands are not connected to the provincial highway system., Sointula and Alert Bay are linked by daily BC Ferry service to the Port McNeill and Vancouver Island.

Port Hardy is the base for BC Ferries' services to the north and central coasts, and also has a deep sea port capable of handling large ships. All of the NIS communities have harbours providing moorage and landing docks for coastal barges and commercial fishing and recreational vessels.

The NIS is serviced by scheduled and charter air routes to a regional airport at Port Hardy, by charter service to local airports at Port McNeill and Alert Bay, and by float plane or helicopter service to outlying communities, tourism lodges and resource camps.

Appendix B: People Interviewed during Visit to Study Area

First	Last	Organisation
Mickey	Flanagan	Keltic Seafoods
Dave	Pashley	Englewood Packing Co.
Harry	Mose	Mayor of Port Hardy; Seaforth Trucking
Annemarie	Koch	RDMW
Evelyn	Clark	CFDC
Bill	Shephard	RDMW
Maxine	Bruce	Kwakiutl Band (Fort Rupert)
John	Bielka	PanFish

Appendix C: Information Session Participants

First	Last	Organisation
Paul (Kip)	Beck	Quatsino Seafood
Darlene	Beise	
Maxine	Bruce	Kwakiutl Band
Diane	Carley	
Evelyn	Clark	CFDC
Mickey	Flanagan	Keltic Seafoods
Annette	Fournier	Coal Harbour
Patricia	Gagnon	
Arnold	Harasymchuk	MSRM
Rene	Hunt	Kwakiutl
Ron	Johnston	
Annemarie	Koch	RDMW
Charlie	Minns	Minns Consulting
Leonard	Nelson	Quatsino
Tom	Nelson	Quatsino First Nation
Richard	Nelson	Quatsino
David	Schmidt	Quatsino
Rod	Sherrell	RDMC
Dave	Smith	MAFF
Fred	Speck	KTFC
Phil	Wainwright	RDMW
Ralph	Wallas	Quatsino First Nation
Charlie	Williams	Kwakiutl Territorial Fisheries Commission